

190-1480

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

IN THE APPLICATION OF

Rowley

SERIAL NO:

FILED:

FOR: DATA LOOKUP

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) Group Art Unit No.  
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jc997 U.S. PTO  
10/057330  
01/25/02

**CLAIM FOR PRIORITY**

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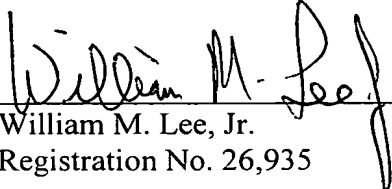
Dear Sir:

Under the International Convention, for the purposes of priority, applicant claims the benefit of British Application No. 0103235.8, filed February 9, 2001.

A certified copy of said application is appended hereto.

DATE: January 25, 2002

Respectfully submitted,

  
\_\_\_\_\_  
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## INVESTOR IN PEOPLE

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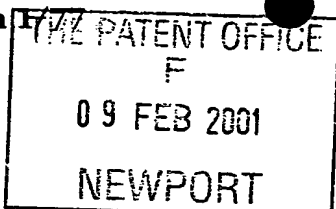
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Signed

Dated 17 December 2001

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Patent  
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09FEB01 E604846-1 D02759  
P01/7700-0.00-0103235.8

# Request for grant of a patent

(See the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

The Patent Office

09 FEB 2001

Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference C1467

2. Patent application number  
(The Patent Office will fill in this part)

0103235.8

3. Full name, address and postcode of the or of each applicant (underline all surnames)

INTERNATIONAL COMPUTERS LIMITED  
26 Finsbury Square, London EC2A 1SL

Patents ADP number (if you know it)

If the applicant is a corporate body, give the country/state of its incorporation

ENGLAND

28258008

4. Title of the invention

DATA LOOKUP

5. Name of your agent (if you have one)

"Address for service" in the United Kingdom to which all correspondence should be sent (including the postcode)

S.M. Dupuy  
Intellectual Property Department  
International Computers Limited  
Stevenage  
Herts  
SG1 2DY

Patents ADP number (if you know it)

28258007

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and (if you know it) the or each application number

Country

Priority application number  
(if you know it)

Date of filing  
(day / month / year)

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing  
(day / month / year)

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? (Answer 'Yes' if:

- a) any applicant named in part 3 is not an inventor, or
  - b) there is an inventor who is not named as an applicant, or
  - c) any named applicant is a corporate body.
- See note (d))

YES

**Patents Form 1/77**

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form

Description 11

Claim(s) 4

Abstract 1

Drawing(s) 1 + 1 SW

10. If you are also filing any of the following, state how many against each item.

Priority documents -

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Statement of inventorship and right to grant of a patent (Patents Form 7/77) 2

Request for preliminary examination and search (Patents Form 9/77) 1

Request for substantive examination (Patents Form 10/77) -

Any other documents (please specify) Fee Sheet

11. I/We request the grant of a patent on the basis of this application.

Signature

Date

12. Name and daytime telephone number of person to contact in the United Kingdom

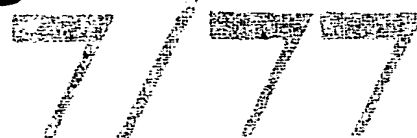
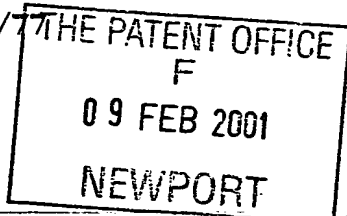
S.M. Dupuy  
01438 786261

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**Statement of inventorship and of  
right to grant of a patent**

09 FEB 2001

The Patent Office

Cardiff Road  
Newport  
Gwent NP9 1RH

1. Your reference

C1467

0103235.8

2. Patent application number  
(if you know it)

3. Full name of the or of each applicant

INTERNATIONAL COMPUTERS LIMITED

4. Title of the invention

DATA LOOKUP

5. State how the applicant(s) derived the right  
from the inventor(s) to be granted a patent

BY REASON OF EMPLOYMENT

6. How many, if any, additional Patents Forms  
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7.

I/We believe that the person(s) named over the page (and on  
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which the above patent application relates to.

Signature

Date

*S.M. Dupuy*

8. Name and daytime telephone number of  
person to contact in the United Kingdom

S.M. Dupuy  
01438 786261

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Enter the full names, addresses and postcodes of the inventors in the boxes and underline the surnames

David John Rowley  
30 Chartwell Gardens  
Appleton  
Warrington  
Cheshire  
WA4 5HZ

07098965001

Patents ADP number (if you know it):

Patents ADP number (if you know it):

Reminder

Have you signed the form?

Patents ADP number (if you know it):

# DATA LOOKUP

This invention relates to data lookup, that is to say to methods and means enabling a user of a computer system or computerised device to search for information from a sorted data set.

Such a lookup method and means is of particular relevance to computer systems and computerised devices which have a limited text-entry capability or where there is a preference for use of a pointing device. A current common mechanism for searching for information from a sorted data set involves providing the first few characters of the key field of a required item, for example a surname in a directory containing surnames and associated telephone numbers, and then choosing one of the resultant hits for a final detailed interrogation and extraction of the required information, for example the required telephone number. This can be time consuming when working on a device with a limited text-entry capability, such as a WAP (Wireless Application Protocol) phone or a PDA (Personal Digital Assistant), and the number of hits returned can be uncomfortably large when common characters are entered, for example SMIT, ROBER. The user is then either forced to enter a larger number of characters or to page through the interim results, which can result in a large number of communications with the service providing the data. It is an object of the present invention to provide an alternative method for looking up information held in a sorted data set.

According to one aspect of the present invention there is provided a method whereby information stored as, or capable of being made available as, a sorted data set can be looked up by a user of a device, disposed remotely from the location where the information is but in communication therewith, in response to the user making selections on the device, wherein the user makes a selection to initiate an enquiry of the said data set, wherein there follows a succession of steps in which a list comprising the said data set is divided into named list portions, the names of which are transmitted to the device and the name of the list portion containing a required information item is selected by the user, the selected list portion is divided into further named list portions, and so on until the user can select the name corresponding to the required information item itself, when the full details of the required information item can be transmitted to the device.

According to another aspect of the present invention there is provided a method whereby information stored or available at a first location as a sorted data set can be looked up by a user on a device remote from the first location, but in communication therewith, in response to the user making selections on the device, the method including the steps of:

- (a) at the remote device initiating an enquiry of a said data set;
- (b) at the first location, responding to the enquiry by dividing a list comprising said data set into a plurality of list portions each commencing with a respective start key relevant to the information and recognisable by the user, and transmitting the start keys of the plurality of portions to the remote device;
- (c) at the remote device, selecting the start key corresponding to the list portion containing a required information item;
- (d) at the first location, dividing the list portion corresponding to the selected start key into a further plurality of portions with respective start keys and transmitting the respective start keys of the further plurality of portions to the remote device;
- (e) at the remote device, selecting the start key corresponding to the further portion containing the required information item, and so on until the start key corresponding to the required information item itself can be selected.

According to a further aspect of the present invention there is provided a data lookup system comprising at a first location means for storing information as a sorted data set or making information available as a sorted data set, and means for performing operations on the sorted data set, and comprising, at a remote location, a user operated device capable of making selections, wherein in use the user makes a selection to initiate an enquiry of the sorted data set, wherein there follows a succession of steps in which the operations performing means divides a list comprising the said data set into named list portions and transmits the names to the device, the user selects the name of the list portion containing a required information item, the selected list portion is divided into further named list portions, and so on until the user can select the name

corresponding to the required information item itself, when the operations performing means can supply the full details of the required information item to the device.

According to still another aspect of the present invention there is provided a data lookup system comprising at a first location means for storing information as a sorted data set or means for making information available as a sorted data set, and means for accessing the sorted data set, operating on the sorted data set to produce lists and transmitting list identity information and information details to a remote location, and comprising a user operated device at the remote location capable of initiating an enquiry of the sorted data set and capable of making selections, wherein in response to a said enquiry, the accessing means divides a list corresponding to the sorted data set into a plurality of list portions each commencing with a respective start key relevant to the information and recognisable by the user and transmits the plurality of start keys to the remote device, wherein the user selects the start key corresponding to the list portion containing a required information item, wherein the accessing means divides the selected list portion into a further plurality of list portions with respective start keys, wherein the user selects the start key corresponding to the further list portion containing the required information item, and so on until the start key corresponding to the required information item itself can be selected.

Embodiments of the invention will now be described with reference to the accompanying highly schematic drawing which illustrates a data lookup system by means of which a user of a remote device can search for information.

The information which a user 1 of a remote device 2 wishes to obtain is illustrated as held on a database 3 of a computer service 4, although it may simply be in any computer file containing data. The computer service 4 also includes means 5 to access the information on the database 3 in response to a request for information from the user; to "convert" it (operate on it) into a suitable form; and to transmit that form to the user, who responds by making a selection, which is indicated to the computer service. The information/data is either stored in the form of an ordered list or capable of being made available as an ordered list, in which case means to provide such ordered lists are also required. The conversion of data in an ordered list involves dividing the list into a predetermined number of portions, typically dividing it into two portions. The user is then asked to select the portion in which the required information is to be found. The selected

portion is then divided again and the user asked to select the relevant portion, and so on until a small enough number of items remain for the user to be able to select a particular one and for the computer service to then provide the full information for that item. In the case of halving the list, this is a so-called binary chop or binary search method.

The computer service, in this embodiment, holds a database of information which the user wishes to interrogate to obtain a single or a small number of hits. Examples of such information are telephone directories, staff lists and building lists. The database can contain ordered lists relating to one or more of such types of information.

A required feature is that there must be some element or elements of each information record in the database which can be treated as a key and is recognisable by the user, for example a surname/forename, a post code, a telephone number, a staff number, site identification etc. When a user makes a request for information of a particular type using the remote device, the request will identify that a search is required and what information type is of interest, for example the user may select "Name Lookup" or "Site Lookup" from a menu of possible databases which can be searched.

The user will make the request using the remote device over whatever communications protocol/route is appropriate/convenient for access to the information by that device.

When the computer service receives the request it analyses the full list available and splits it into two approximately equal portions. Each portion has a start and end key, for example the first surname and the last surname on each list portion, that is a first portion may have a start key ADAMS and an end key MURPHY, and a second portion may have a start key NASH and an end key ZACHARIA. The service replies to the enquiring device with two choices: the first or the second portions, identified in a convenient manner, such as by the first key in each portion e.g. ADAMS and NASH. The user selects, by whatever means is most convenient on the remote device, the identification of the portion within which the required item lies. SMITH will lie in the second portion in the above example. The computer service recognises the portion chosen by the user, splits this portion into two approximately equal new portions, say with start keys NASH and TAIT in this example, and sends those portion identifications to the remote device. The

portion selection and splitting procedure is repeated until the service recognises that a small enough number of "hits" remain for the user's device to be able to select directly from them, in which case the sole or each of the hits remaining will be indicated to the user. The number will be dependent on the type of device in use. The user can then make a final choice from the remaining item or list of items, and the service will respond with the complete data held on the chosen item as identified by its key.

The steps described above are summarised in the following (Table 1), which indicates handheld device (remote device) activity and the corresponding server (computer service) activity.

STEP	HANDHELD DEVICE ACTIVITY	SERVER ACTIVITY
1	User initiates enquiry in List L, such as by selecting "List L lookup".	
2		Count entries in List L. If lower than the number conveniently displayable on the handheld device, go to step 6.
3		Divide List L into two approximately equal sub-lists (List A and List B). For an odd number of entries, allow the first sub-list to be longer. Generate response to handheld device with two options A and B to choose either the first or second sub-list, by showing the first entry in each list.
4	User decides if required item is in List A or B and "clicks" on (selects) the appropriate response.	
5		Replace List L by either A or B, depending on user response and go to step 2.

6		Format the remaining entries with limited information for each and respond to handheld device.
7	If more detailed information is required on a particular target entry, the user "clicks" on (selects) it.	
8		Extract the full details for the target entry, format and return to the handheld device.

Table 1

Examples of use with two particular handheld devices will now be described.

In the case of a Nokia 7110 WAP mobile phone, WAP pages can be displayed. These are similar to pages displayed by a Web Browser, but are in text format only and with very limited functionality. Navigation on this device is accomplished by rotating a "Navi Roller", which highlights each possible "clickable" (selectable) field in turn. Once the highlight is over the desired entry, the "Navi Roller" is pushed in to "click" on (select) it. This response is returned to the WAP server computer.

For this type of device step 1 of Table 1 is achieved by navigating to a menu entry on a WAP service where one of the options is, say, "Site Lookup", and selecting this entry. For step 4, the user selects the required sub-list by highlighting and then clicking on it with the Navi Roller. For step 7, the user may click on the final result displayed to request more detail.

In the case of a Psion 5 PDA, WAP pages or simple HTML pages can be displayed and either can be used for the lookup process. Navigation on this type of device is accomplished by means of a "pen" and a touch-sensitive screen. The pen acts in a similar manner to a mouse on a Windows PC. To highlight an entry on the screen the user taps once, and to select an option, the user double-taps (in the same manner as a double-click). This device can display several lines at once, so the server could be asked to send, for example, six lines each time. For this type of

device step 1 is achieved by navigating to a menu entry on a WAP/HTML service where one of the options is, say, "Site Lookup", and double tapping. For step 4 the user selects the required sub-list by double-tapping it. For step 7 the user may double-tap on the final result displayed to request more detail.

A specific example of searching a list is set out in Table 2.

The list to be searched is that of ICL sites, of which there are over 650, each with a unique 5-character code, ranging from ABR01 to ZIM04. Each site has a range of information associated with it including internal dialling code, external telephone number, address, post-code, country, extension numbers for enquiries and reception.

It is assumed that List L contains the entries which have not yet been discarded and that the handheld device is a WAP mobile phone which can only display two entries at a time. Lists A and B are sub-lists of L between which the user will make a choice. After each choice, List A or List B replaces List L, as appropriate. A search is to be made to find the site (target) MAN30 and the activity is split between the handheld device and the service as follows:

STEP	HANDHELD DEVICE ACTIVITY	SERVER ACTIVITY
1	Initiate enquiry.	
2		Determines there are 674 entries in List L.
3		Divide into Lists A and B. List A starts with ABR01. List B starts with MAC01.  Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the second list and clicks on B:MAC01.	

5		Replace List L by List B, which contains 337 entries.
3		Divide List L into two Lists, A and B. List A starts with MAC01. List B starts with SWE52. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the first list and clicks on A:MAC01.	
5		Replace List L by List A, so that list L contains 169 entries.
3		Divide List L into two Lists, A and B. List A starts with MAC01. List B starts with POR07. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the first list and clicks on A:MAC01.	
5		Replace List L by List A, so that List L now contains 85 entries.
3		Divide List L into two Lists, A and B. List A starts with MAC01. List B starts with MCS34. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the first list and clicks on A:MAC01.	

5		Replace List L by List A, so that List L now contains 43 entries.
3		Divide List L into two Lists, A and B. List A starts with MAC01. List B starts with MCS06. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the first list and clicks on A:MAC01.	
5		Replace List L by List A, so that List L now contains 22 entries.
3		Divide List L into two Lists, A and B. List A starts with MAC01. List B starts with MAN32. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the first list and clicks on A:MAC01.	
5		Replace List L by List A so that List L now contains 11 entries.
3		Divide List L into two Lists, A and B. List A starts with MAC01. List B starts with MAN27. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the second list and clicks on B:MAN27.	

5		Replace List L by List B so that List L now contains 5 entries.
3		Divide List L into two Lists, A and B. List A starts with MAN27. List B starts with MAN30. Format WAP page with these two entries and return to WAP phone.
4	User decides the target is in the second list and clicks on B:MAN30.	
5		Replace List L by List B so that List L now contains 2 entries (and step 6 can follow directly).
6		Only MAN30 and MAN31 remain – put both on the WAP page and return to WAP phone.
7	User sees required (limited) information on MAN30 and MAN31 and clicks on MAN30.	
8		Look up detailed information for MAN30 and format suitable response to user device.

Table 2

As will be appreciated, since the overall code only has 5 elements MAN30 is not difficult to enter on a device permitting such a degree of text entry, and hence the above is not a particularly good example, since it could be entered and searched for directly. It does, however, illustrate the principles involved with the binary chop method. Searching for common names or long names, or when using a device with a pointing device could clearly be facilitated by the method.

The nature of the method means that there is no requirement for the computer service to hold "state" information about enquiring users or their position in the process, although state information may be retained between stages in the process if wished and if practical.

It may be appropriate if each user who registers with the service actually logs the characteristics of their remote device, for example the number of lines of text which can be displayed.

The method is also applicable to devices which do have a full text-entry capability, but where the user prefers to use a pointing device to select items, for example a Windows PC with a mouse.

Whereas in the above the lists are divided into two portions at each stage, it would be possible to increase the number of portions at each stage, provided the users' device can accommodate them. For example the service could split the complete list into four portions at each stage, which would significantly reduce the number of interactions (communications) between the device and the service. The binary chop approach gives a small number of interactions, for example a list of 65536 items can be searched with a maximum of 16 interactions, each of which requires only a "click" with a pointing device. If the list were divided into four portions each time, then the maximum number of interactions would be reduced to 8.

In addition, whilst the invention is described in connection with a PDA, it is equally applicable to other handheld computing devices. Similarly, the WAP phone may alternatively be comprised by any other data-capable phone.

As will be appreciated the invention provides a method whereby a user of a remote device can look up information stored or available as a sorted data set at a central location with minimal action being required by the user and with the transfer of minimal information between the user's remote device and the central location. The user merely makes selections, such as with a pointing device, and is not required to indicate/type in any details whatsoever of what is being looked for.

CLAIMS

1. A method whereby information stored as, or capable of being made available as, a sorted data set can be looked up by a user of a device, disposed remotely from the location where the information is but in communication therewith, in response to the user making selections on the device, wherein the user makes a selection to initiate an enquiry of the said data set, wherein there follows a succession of steps in which a list comprising the said data set is divided into named list portions, the names of which are transmitted to the device and the name of the list portion containing a required information item is selected by the user, the selected list portion is divided into further named list portions, and so on until the user can select the name corresponding to the required information item itself, when the full details of the required information item can be transmitted to the device.
2. A method whereby information stored or available at a first location as a sorted data set can be looked up by a user on a device remote from the first location, but in communication therewith, in response to the user making selections on the device, the method including the steps of:
  - (a) at the remote device initiating an enquiry of a said data set;
  - (b) at the first location, responding to the enquiry by dividing a list comprising said data set into a plurality of list portions each commencing with a respective start key relevant to the information and recognisable by the user, and transmitting the start keys of the plurality of portions to the remote device;
  - (c) at the remote device, selecting the start key corresponding to the list portion containing a required information item;
  - (d) at the first location, dividing the list portion corresponding to the selected start key into a further plurality of portions with respective start keys and transmitting the respective start keys of the further plurality of portions to the remote device;

- (e) at the remote device, selecting the start key corresponding to the further portion containing the required information item, and so on until the start key corresponding to the required information item itself can be selected.
3. A method as claimed in claim 2 and further including the step of
    - (f) at the first location, determining the full details corresponding to the required information item for the required information start key and transmitting the full details to the remote device.
  4. A method as claimed in claim 2 or claim 3, wherein the step of initiating an enquiry comprises the step of the user selecting a data lookup service corresponding to the said stored data set from a menu including a plurality of such services.
  5. A method as claimed in any one of claims 2 to 4, wherein each plurality of portions comprises two portions.
  6. A method as claimed in any one of claims 2 to 4, wherein each plurality of portions comprises four portions.
  7. A method as claimed in any one of claims 2 to 6, wherein the remote device is a WAP (Wireless Application Protocol) phone.
  8. A method as claimed in any one of claims 2 to 6, wherein the remote device is a PDA (Personal Digital Assistant).
  9. A method of looking up information substantially as herein described with reference to the accompanying drawing.
  10. A data lookup system comprising at a first location means for storing information as a sorted data set or making information available as a sorted data set, and means for performing operations on the sorted data set, and comprising, at a remote location, a user operated

device capable of making selections, wherein in use the user makes a selection to initiate an enquiry of the sorted data set, wherein there follows a succession of steps in which the operations performing means divides a list comprising the said data set into named list portions and transmits the names to the device, the user selects the name of the list portion containing a required information item, the selected list portion is divided into further named list portions, and so on until the user can select the name corresponding to the required information item itself, when the operations performing means can supply the full details of the required information item to the device.

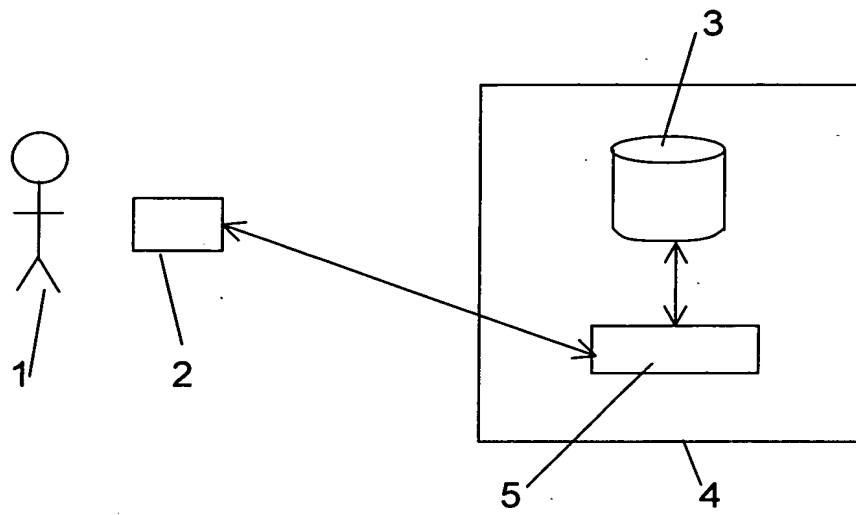
11. A data lookup system comprising at a first location means for storing information as a sorted data set or means for making information available as a sorted data set, and means for accessing the sorted data set, operating on the sorted data set to produce lists and transmitting list identity information and information details to a remote location, and comprising a user operated device at the remote location capable of initiating an enquiry of the sorted data set and capable of making selections, wherein in response to a said enquiry, the accessing means divides a list corresponding to the sorted data set into a plurality of list portions each commencing with a respective start key relevant to the information and recognisable by the user and transmits the plurality of start keys to the remote device, wherein the user selects the start key corresponding to the list portion containing a required information item, wherein the accessing means divides the selected list portion into a further plurality of list portions with respective start keys, wherein the user selects the start key corresponding to the further list portion containing the required information item, and so on until the start key corresponding to the required information item itself can be selected.
12. A data lookup system as claimed in claim 11 and wherein the accessing means determines the full details of the required information item and supplies them to the remote device in response to the user selecting the required information item start key.
13. A data lookup system as claimed in claim 11, wherein the user operated device is a WAP (Wireless Application Protocol).

14. A data lookup system as claimed in claim 11, wherein the user operated device is a PDA (Personal Digital Assistant).
15. A data lookup system as claimed in claim 11, wherein a pointing device is used for making selections at the user operated device.
16. A data lookup system as claimed in claim 11, wherein each plurality of list portions comprises two list portions.
17. A data lookup system as claimed in claim 11, wherein each plurality of list portions comprises four list portions.
18. A data lookup system substantially as herein described with reference to and as illustrated in the accompanying drawing.

DATA LOOKUP

Abstract

A method whereby information stored as, or capable of being made available as, a sorted data set at a first location (4) can be looked up by a user (1) on a device (2) remote from the first location, with minimal action by the user and the transmission of minimal information between the user device and the first location. Typically the device is a mobile device with limited text entry capability, for example a WAP phone with only two lines of text, or a PDA with a pointing device, but the method is also useful in other arrangements where users find pointing devices convenient. The user is required to make selections from offered portions of a list comprising the sorted data set. The data items in the list each have a key relevant to the information, and which the user can recognise e.g. a surname for a telephone directory. The list is initially divided into, say, two portions at the first location when a user indicates a search is required, and the keys corresponding to the first item in each list portion (start keys) are transmitted to the user. The user selects the start key corresponding to the portion containing the required item and that start key is transmitted to the first location. The corresponding list portion is divided at the first location and the respective start keys transmitted to the user, who selects the appropriate start key, and so on until the user is able to select the key of the required item itself, when the first location can supply the full details associated with that key. The user does not have to indicate what is being looked for, merely make selections.



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